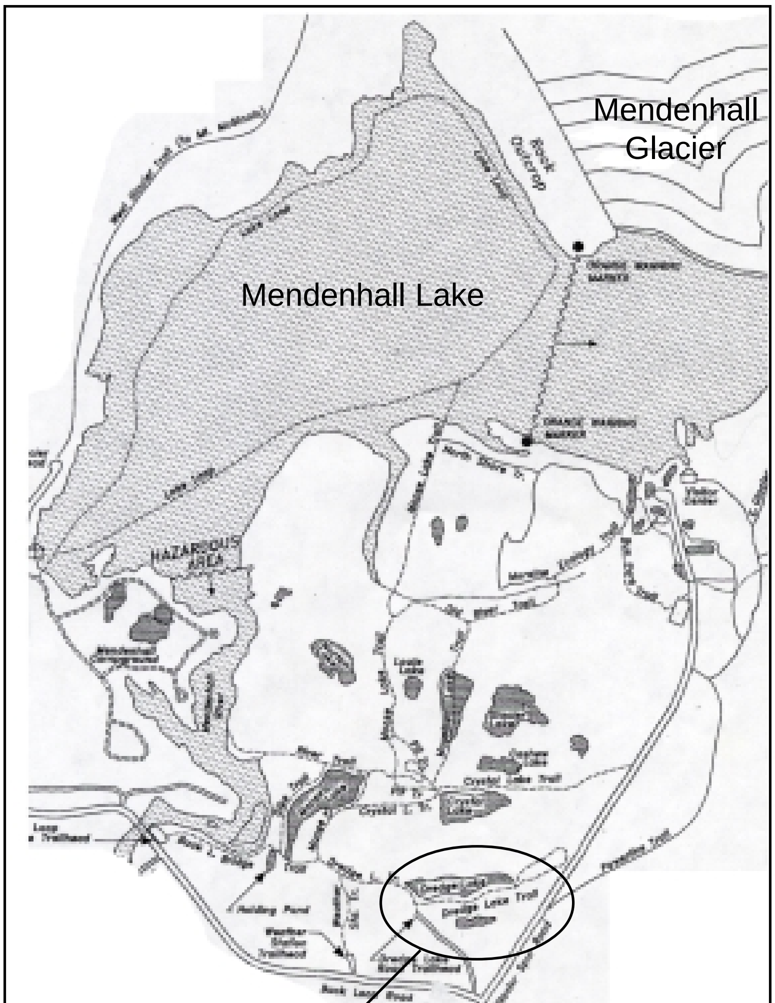
Is This Good Habitat for Amphibians?

Now that you know about amphibian populations in general, and in SE Alaska specifically, it's time to turn what you learned inside, out. Outside, that is! You'll take what you've been learning in class out to the field as you investigate amphibian habitat at a local study site.

Mendenhall Glacier Recreation Area



Dredge Lake

The study site is located at Dredge Lakes in the Mendenhall Glacier Recreation Area*. You may already have been there on a school field trip, or on your own. The area near Dredge Lake was good amphibian habitat in the past, although today, few if any amphibians are found there. You'll see if this area is still good habitat based on plant and water quality surveys.

* For teachers outside Juneau, choose a known or historical breeding site to explore with your class.

You may also already know something about sampling. For example, you may know what a random sample is. The sampling we'll do is a little different – though it might feel like we're going for a leisurely walk along the edge of a pond, we'll actually be looking for important plant species and sampling water for three water quality parameters – pH, dissolved oxygen and water temperature.

Science Activity: **Is This Good Habitat for Amphibians?**

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PUZZLING PLANTS:

Although researchers don't know why these plants are important, they think they are important because they find them in the same places they find amphibians. Do they provide food or shelter? Or are they just good water quality indicators – does their presence tell us something about the health or quality of the water? We'll be looking for three different categories of plants, based on where they live: in the emergent zone, the floating zone, and the submerged zone.

WHAT'S IN THE WATER?

Although researchers test water for all sorts of physical, chemical and biological parameters, we'll focus on these three: **pH**, **dissolved oxygen** and **water temperature**. By testing the water for these parameters, and comparing our data to data collected in control study sites where amphibians are found today, we can make hypotheses about what might be happening at our study site.

1. The concentration of hydrogen ions in a solution is called **pH**. An **ion** is an atom or group of atoms in which the number of electrons is different than the number of protons. Most of us understand pH more intuitively – it's a measure of how much acid is or isn't in the water. The pH scale ranges from 1, or acid, to 14, or basic, with 7 being neutral. This scale is logarithmic, so that a change of one unit means a tenfold change in concentration. Most aquatic organisms can adapt to minor changes in pH, but will not tolerate big swings.

2. Oxygen is just as important to life in water as it is to life on land. **Dissolved oxygen** – or DO – is the measure of how much oxygen is dissolved in water. Measured in milligrams per liter of water, DO is affected by a variety of factors including altitude, types and numbers of plants, water movement, light penetration, water temperature and dissolved solids in the water.

For example, as water low in oxygen comes into contact with air, it absorbs oxygen from the air. The turbulence of running water adds a lot of oxygen from the air to the water. Ponds or puddles with little or no shade can experience dramatic changes in DO during warm or sunny weather. Anything that causes a change in DO levels in streams, lakes or ponds can impact the aquatic organisms that live there.

3. **Water temperature** is easy to measure with an everyday, household thermometer. Cooler water can hold more oxygen, which is then available to aquatic organisms like amphibians and fish.

Local research shows amphibians can survive a range of pH values – newts, frog and toad larvae were found in even fairly acidic water. Amphibians can also tolerate low DO – while low DO can be a major problem for fish, it's less so for amphibians because they can breathe through gills, lungs and skin, depending on life stage. As for temperature, amphibians seem less dependent on actual temperatures, than on temperature regimes – most tadpoles prefer shallow water that warms up quickly and strongly during the day.

Once you explore your study site, look for plants and sample the water, you'll bring your data back to class and compare it to data collected from local sites that researchers know to be good habitat today. By comparing your data to theirs, you can make hypotheses about what might be happening at Dredge Lakes.

Objectives:

1. Students understand three water quality parameters and how to test for them.
2. Students understand the importance of these parameters to aquatic organisms.
3. Students compare their data to data from control site, and make hypotheses about differences and significance.

Materials:

1. control site data	(1 per class)
2. blank data sheet	(1 per group)

You may want to copy data sheets on the Rite in the Rain™ paper.

3. pencil	(2 per group)
4. Aquatic Plants ID transparency	(1 per class)
5. laminated plant ID cards	(1 set per group)
6. magnifying lens	(2 per group)
7. pH strips	(1 per group)

"Narrow range" litmus paper is the best way to measure pH. Without touching the test area of your strip, simply dip the paper into flowing water, remove and read the color change. pH strips are available from:

Acorn Naturalists
800-442-8886
http://www.acornnaturalists.com/store/

Carolina Biological Supply
800-334-5551
http://www.carolina.com/

Forestry Suppliers, Inc.
800-752-8460
http://www.forestry-suppliers.com/

8. thermometer (1 per group)
9. dissolved oxygen test kit (2 per class)

Measuring DO requires a chemical test kit. Titration kits measure DO by binding and unbinding dissolved oxygen with a series of chemical agents and reagents and requires several steps before color changes are read to measure DO. Colorimetric kits require only one step and are more reliable, but more expensive.

Your school may have a DO test kit you can use, or you may chose to buy one from sources above. You may also be able to borrow one from your local office of the Alaska Department of Fish & Game, US Forest Service or US Fish & Wildlife Service.

Procedure:

• ***In Class – Before Field Trip***

1. Review amphibian life histories, habitat requirements and theories for decline.
2. Brainstorm local study sites, with emphasis on appropriate habitat types.
3. Make plant ID cards by giving each student a black and white photocopy of the plant drawings included in this activity. Use the plant transparency to guide students as they color their drawings. When finished, laminate pages to create sturdy waterproof plant ID cards, or protect paper copies by enclosing them in large Ziploc bags.
4. Describe and model water sampling and testing procedures.
5. Divide students into groups of 4-5, and practice testing with tap water.
6. Emphasize that this is not a collecting trip, but a habitat assessment, to help students focus on being accurate and respectful observers.

• ***In the Field***

1. Remind students this is not a collecting trip, but a habitat assessment.
2. Allow groups to choose jobs: recorder, sampler, tester, plant identifier, etc.
3. Walk along pond edge and allow groups to space out for sampling.
4. Conduct water sampling and plant identification. Record data on data sheet.
5. Collect completed data sheets.

• ***In Class – After Field Trip***

1. Encourage students to share thoughts, discoveries and surprises from the field.
2. Give each group its data sheet for comparison to one another’s and the control.
3. Work together to answer the following questions:

    • How do students’ data compare to control data?
    • Is study site good habitat based on plants and water quality?
    • If no, what may have impacted the study site to change the habitat?
    • If so, and no amphibians were observed, what other factors may be important?

Assessment:

1. Students understand and can define three water quality parameters.
2. Students understand the significance of water quality parameters to amphibians.
3. Students work cooperatively and respectfully to conduct habitat assessments.
4. Students compare their data to control and hypothesize about significance.

National Science Education Standards:

Content Standard A:

- Develop abilities necessary to do scientific inquiry
- Develop understandings about scientific inquiry

Alaska Content Standards:

Science A (1)
Science E (1)

Juneau School District Core Curriculum:

Essential Questions explored throughout Life, Earth & Physical Science:
Life and Human Biology(6th-8th):

- Systems: How can we understand a complex world through its systems?
- Patterns of Change: How does understanding patterns of change allow us to interpret the world?
- Human Impacts: How do human activities affect our environment?

Extensions:

1. **CONCENTRATE on the CONNECTIONS!** Conduct a general survey of what's living at the study site. Look for aquatic insects like dragonfly nymphs and predaceous water beetles – they are fun to find and act as predators to tadpoles. Or, learn and listen for calls, songs and other vocalizations – birds, frogs and toads all vocalize to attract mates, defend territory and sound the alarm. Sit quietly and you'll be surprised at what you discover!

2. **SHARE YOUR INFORMATION!** Scientists work best when they work together, sharing information and formulating hypotheses to explain the world around us. Now that you've collected and analyzed your data, share it with other scientists working in the field. Contact your local office of the Alaska Department of Fish & Game, US Forest Service or US Fish & Wildlife Service to share your findings.

When sharing your data with scientists, be as specific as possible, especially about your sampling site. Consider bringing along a hand-held GPS unit to log the exact location of your sampling sites, so that local researchers can find it later. You may even be able to borrow a GPS from one of the agencies above for your field trip.

3. **INTERVIEW a LOCAL EXPERT!** Most of the information we have about Dredge Lakes is anecdotal – based on someone's personal account, rather than on a scientific study. See if you can you find someone who's lived in Juneau long enough to remember finding amphibians around town. Anecdotal information can be just as important to unlocking the mystery of vanishing amphibians as today's scientific research.

4. **STUDY ANOTHER SITE!** Look for a site to study near your school, home or favorite recreation area. See if you can find good amphibian habitat around town and share your findings with others working in the field.

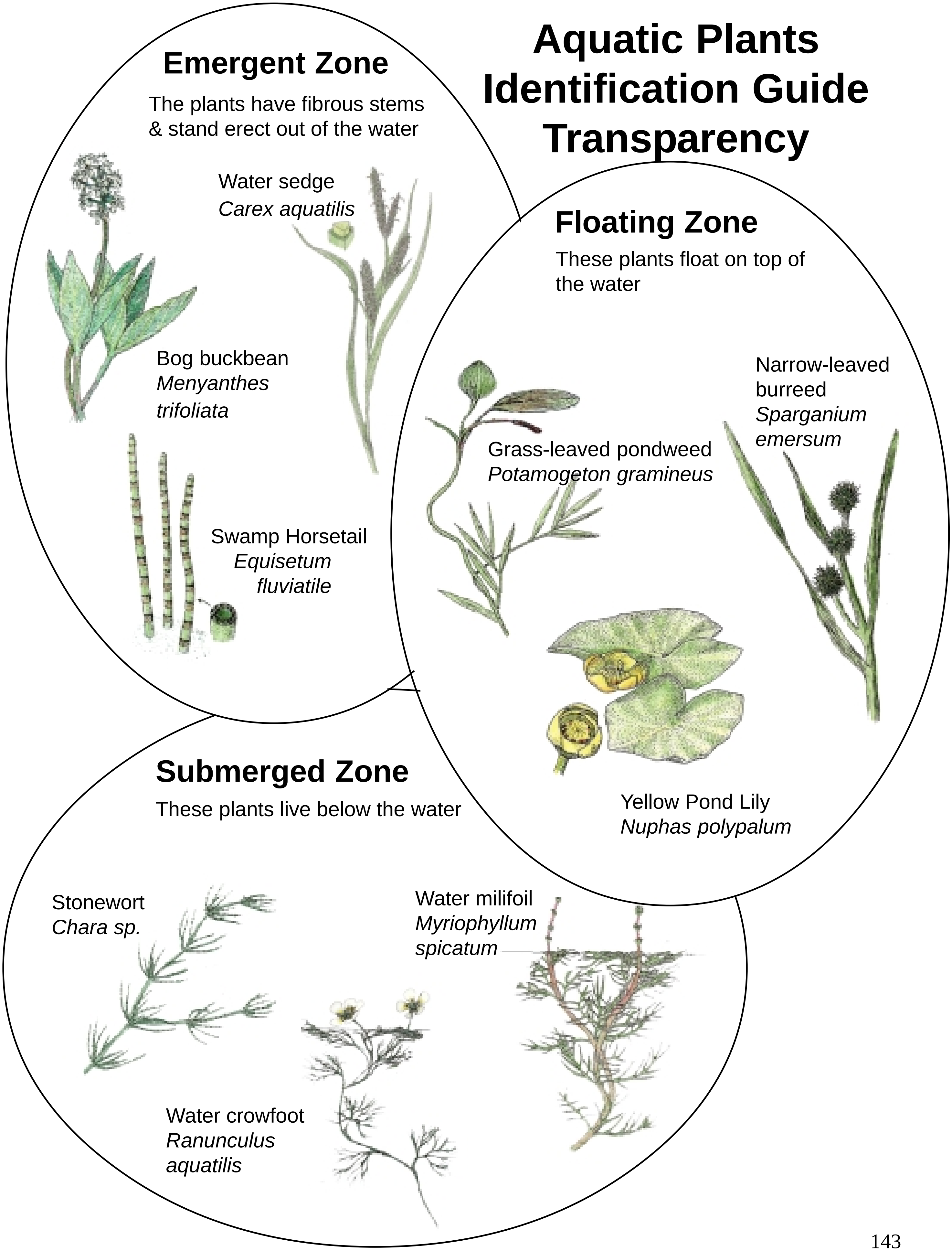
REMEMBER: The folks responsible for calling attention to the mystery of vanishing amphibians were a group of 8th graders, very much like you, who went on a field trip and were surprised by what they saw. By participating in this amphibian curriculum, you are joining scientists around the world – all working to solve the mystery of vanishing amphibians. And with so many more questions than answers, you just might be the one to solve the puzzle!

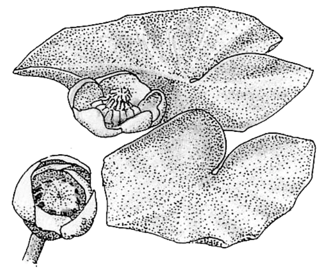
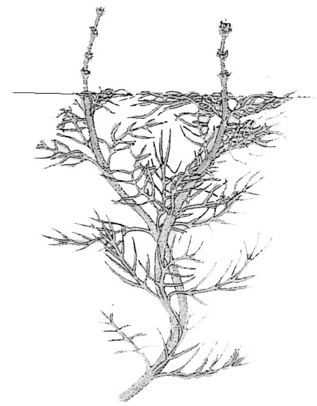
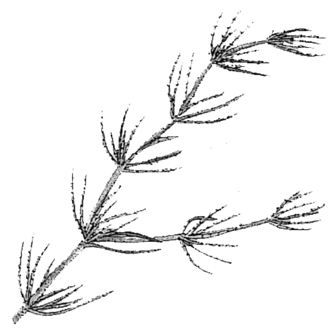
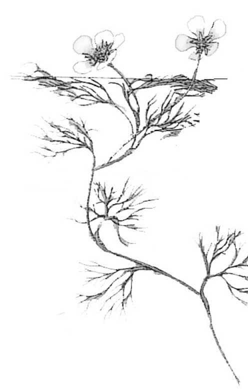
References:

Carstensen, Richard. "Aquatic Vegetation." 1995.

Carstensen, Richard, Mary Wilson and Robert Armstrong. Habitat Use of Amphibians in Northern Southeast Alaska. Report to the Alaska Department of Fish & Game: December 2003.

Aquatic Plants Identification Guide Transparency



Emergent Zone The plants have fibrous stems & stand erect out of the water.	**Floating Zone** Like the name implies, these plants float on top of the water.	**Submerged Zone** These plants live below the water.
Buckbean 	Yellow Pond Lily 	Water Milfoil 
Sedge 	Pond Weed 	Stonewort 
Swamp Horsetail 	Burreed 	Water Crowfoot 

Give black & white copies of this page so students can make laminated plant ID cards (see Procedure).

Control Study Site Data

From April 2002 to October 2003, local scientists, researchers and naturalists surveyed ponds in Juneau and other areas in Southeast Alaska, to understand the health and location of breeding populations of frogs, toads and newts. The data ranges below are taken from their findings.

pH, or ACIDITY:

Frog larvae, toad larvae and adult newts were found in 25 local ponds with these high and low pH ranges:

	low pH	high pH
wood frog	4.5	5.5
rough-skinned newt	5.1	6.7
western toad	5.3	9.8
spotted frog	6.9	9.8

How did your pH compare?

Is the pH your group found within these ranges?

DISSOLVED OXYGEN (DO):

Most local ponds had fairly high DO levels, although a handful had DO levels of only 5 mg/L. This is considered the minimum threshold for fish and some aquatic invertebrates.

	low DO mg/L	high DO mg/L
wood frog	9	9
rough-skinned newt	5	9
western toad	5	19
spotted frog	5	19

What was the DO at your study site?

Is the DO your group measured within these ranges?

WATER TEMPERATURE:

15 – 26 degrees Celsius / 59 – 79 degrees Fahrenheit

Remember, amphibians are less dependent on actual temperatures than on changes in temperatures – they prefer shallow ponds that heat up fast during the day. How does your pond compare?

Amphibian Habitat Assessment Form… the Frog Log

Survey Crew: ______________________________________

Date: _____ / _____ / _____
Time: __________ am or pm

Weather:
Air Temperature: __________ degrees Celsius or Fahrenheit
Cloud Cover: __________ %
Current Precipitation: __________ Please Describe

Habitat Type (circle one):
Freshwater Pond Lake Stream River Muskeg
Name of Waterbody: ____________________
GPS Coordinates (if avail.): _______________

Plant Survey:
Plant 1: __________ Yes or No
Plant 2: __________ Yes or No
Plant 3: __________ Yes or No
Plant 4: __________ Yes or No
Plant 5: __________ Yes or No
Plant 6: __________ Yes or No
Plant 7: __________ Yes or No
Plant 8: __________ Yes or No
Plant 9: __________ Yes or No

Water Sampling:
Temperature: __________ degrees C or F
pH: __________
Dissolved Oxygen: __________ mg/L

Amphibian Habitat Assessment Form… the Frog Log

Survey Crew: ______________________________________

Date: _____ / _____ / _____
Time: __________ am or pm

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Plant 7: __________ Yes or No
Plant 8: __________ Yes or No
Plant 9: __________ Yes or No

Water Sampling:
Temperature: __________ degrees C or F
pH: __________
Dissolved Oxygen: __________ mg/L